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Basal Trunk And Buttress Root Injuries May Be Associated With Branch Dieback In Black Oak

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ABSTRACT.—Reports a possible association between basal trunk and buttress root injuries and branch dieback of black oak in southern Illinois forests.

KEY WORDS: *Armillaria*, borer, canker, *Cryphonectria*.

During 1986-1990, I noticed that black oaks with branch dieback on upland oak sites in Illinois, Indiana, and Ohio often bore extensive basal trunk injuries. Such injuries could be a direct cause of branch dieback if they disrupted translocation of nutrients and water to the crowns. Indirectly they could also be indicators of general unhealthiness and growth decline in trees with crown dieback.

A study was conducted to quantify the possible relationship of basal trunk injuries with branch dieback in black oaks.

MATERIALS AND METHODS

Four upland oak sites were studied in the eastern section of the Shawnee National Forest in southern Illinois. Three of these—Ozark, Herod, and Glendale—were centered around permanent sample plots established by the Forestry Department of Southern Illinois University. The fourth—Dixon Springs—was centered around a plot established for the National Acid Precipitation Assessment Program (NAPAP). A fifth study area—Jonesboro—was located in the western portion of the Shawnee NF, which was believed by NF personnel to be relatively free of crown dieback. At the four eastern sites, pre-existing plot centers were used as starting points for study tree selection. At the western site, a temporary center was established approximately in the center of the NF upland hardwood management compartment. Study trees were selected along circular, clockwise traverses around the plot centers. Traverses of increasing distance from the centers were made until 20 dominant or codominant black oaks with upper crown dieback encompassing 30 percent or more of their crowns and 20 similar black oaks with less than 30 percent of their crowns affected were found. Crown condition was the only criterion for tree selection. After selection, the condition of the basal trunk of the trees (included exposed portions of major buttress roots) was recorded. The presence of the following conditions was noted: (1) open-faced wounds exposing wood, (2) sunken cankers with attached bark, (3) mycelial fans or rhizomorphs, (4) fungal sporophores, and (5) borer activity as indicated by frass or the presence of egress and entry holes. Data were collected from mid-August until the first of September during the normal time of Armillaria fruiting in southern Illinois. Presence of *Armillaria* spp. was recorded from either fresh sporophores or from shriveled ones, as long as dark mycelial fans or rhizomorphs were associated with them.

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RESULTS AND DISCUSSION

Table 1 shows the indicators of basal trunk injuries recorded. Except for a few anomalies, all the basal injuries were more prevalent on the trees with more dieback at all study sites. Thus, trees with more crown dieback are more likely to have basal wounds (P = 0.026), basal cankers (P = 0.0004), fungal sporophores (P = 0.000008), and borer activity (P = 0.043). Open-faced wounds were the most common type of wound found. Cankers and sites of borer activity were also common. Mycelial fans and fungal rhizomorphs and sporophores were less common. Incidence of mycelial fans and fungal rhizomorphs did not differ between low and high dieback trees (P = 0.30). Recording of the presence of mycelial fans and rhizomorphs was conservative; only visible fans and rhizomorphs or those that could be revealed by hand removal of loose bark were counted. Sporophore occurrence would probably have been higher if the trees had been reexamined in other seasons.

Many trunk injury indicators also occurred on the sample of black oak trees with less crown dieback. This may have been due at least partly to the method of selecting trees in the two categories. Trees with less dieback mostly fell into the range of 10 to 25 percent of crown affected. Trees classified in the higher dieback category were generally in the range of 33 to 50 percent of crown affected. Because the dieback ratings were subjective visual estimates made under essentially closed canopy conditions, the differences between the two categories may not have been as great as desired. Also of interest in this study, very few of the dominant-codominant black oaks in these upland areas were without at least some upper crown dieback.

Table 1. —*Black oak basal trunk indicators of stem injury, Shawnee National Forest, Illinois, 1990*[1]

Study area	Basal wounds	Basal cankers	Mycelial fans rhizomorphs	Fungal sporophores[2]	Borer activity
Ozark	17 (11)	14 (8)	3 (1)	8 (1)	14 (11)
Herod	13 (8)	10 (4)	2 (1)	4 (0)	11 (7)
Glendale	11 (14)	9 (6)	3 (2)	6 (2)	15 (9)
Jonesboro	16 (13)	13 (7)	1 (2)	10 (4)	8 (12)
Dixon Springs	14 (10)	9 (2)	1 (0)	2 (0)	9 (4)
Total	71 (56)	55(27)	10 (6)	30 (7)	57 (43)

[1] Number of trees out of 20 dominant or codominants with 30 percent or greater crown dieback; in parentheses—number of trees out of 20 dominant or codominants with less than 30 percent crown dieback.

[2] *Armillaria* spp.
Bjerkandera adjusta
Cryphonectria parasitica
Fomitopsis spraguei
Gloeoporus dichrous
Grifola frondosa
Xylaria sp.

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